

Claims

1. A speckle based optical navigation sensor comprising:
 - a photodetector array lying in a plane; and
 - a lightpipe having a first and second pair of sides and a first and second face,
 - 5 said first pair of sides oriented perpendicular to said plane, said lightpipe enabled such that speckle entering said first face of said lightpipe is directed to said second face of said lightpipe, said second face of said lightpipe being substantially parallel and proximate to said plane.
- 10 2. The apparatus of Claim 1 wherein said first face is inclined at an angle with respect to said second face thereby increasing the light collection area of said first face.
- 15 3. The apparatus of Claim 1 wherein said second pair of sides have an elliptical shape.
4. The apparatus of Claim 1 wherein said first pair of sides are optically absorptive.
5. The apparatus of Claim 1 wherein said first face comprises a microstructure.
- 20 6. The apparatus of Claim 5 wherein said microstructure is a diffraction grating.
7. The apparatus of Claim 1 wherein said lightpipe is comprised of SiO₂.

8. The apparatus of Claim 1 wherein said lightpipe is comprised of a material having an index of refraction greater than air.

9. A speckle based optical navigation sensor comprising:

5 a photodetector array lying in a plane; and
 an elliptical reflector comprising a pair of elliptical sidewalls, said pair of elliptical sidewalls oriented perpendicular to said plane and positioned such that said photodetector is centered on a first focal line of said elliptical sidewalls.

10 10. The apparatus of Claim 9 further comprising a pair of planar sidewalls disposed perpendicular to said elliptical sidewalls and said plane.

11. The apparatus of Claim 10 wherein said planar sidewalls are coated with a black wax.

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12. The apparatus of Claim 9 further comprising a diffraction grating centered on a second focal line of said elliptical sidewalls.

13. The apparatus of Claim 9 wherein said elliptical sidewalls are coated with
20 aluminum, silver or gold.

14. The apparatus of Claim 9 wherein said elliptical sidewalls are coated with a high reflectivity dielectric coating.

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15. A method for improved speckle based optical navigation comprising:
 - providing a photodetector array lying in a plane; and
 - providing a lightpipe having a first and second pair of sides and a first and second face, said first pair of sides oriented perpendicular to said plane, said lightpipe
- 5 enabled such that speckle entering said first face of said lightpipe is directed to said second face of said lightpipe, said second face of said lightpipe being substantially parallel and proximate to said plane.
16. The method of Claim 15 wherein said first face is inclined at an angle with respect
- 10 to said second face thereby increasing the light collection area of said first face.
17. The method of Claim 15 wherein said second pair of sides have an elliptical shape.
- 15 18. The method of Claim 15 wherein said first face comprises a microstructure.
19. The method of Claim 18 wherein said microstructure is a diffraction grating.
20. The method of Claim 15 wherein said first pair of sides are optically absorptive.

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